

# Experimental investigation of condensation in porous media

## Context

Fluid flow and heat transfer in porous media has been studied for decades, and their theories and physical models have been well developed. However, when phase change in porous media is involved, additional complexities are added to the two-phase flow so that the heat transfer between the porous matrix and the fluids determines the phase change and the fraction of each phase. Among the processes with phase change, condensation remains fairly under-explored despite its various applications including durability and performance of concrete structures, porous fabrics and insulations, underground contamination removal by steam, steam-based gas and oil recovery methods, heat pipes wicks, and geothermal reservoirs.

## Mission

To study the condensation process and the corresponding water transport inside porous media, an experimental setup of vapor injection into a porous sample will be fabricated. To do this, samples with different characteristics (sandstones or/and packed beads) will be used. The samples will be enclosed by a membrane to avoid vapor leakage assuring a uni-directional flow toward the top of the sample. A mixture of steam and air is generated with predefined flow rate and steam quality. The vapor will be measured before its entrance and after its exit from the porous samples, and the amount of condensation and water transport inside the samples will be calculated.

## Candidate's profile

We seek for an enthusiastic candidate enrolled in a Master's program in earth sciences, fluid mechanics, physics, or any other related topic (M2). The candidate should have strong interest in performing experimental studies. Any previous experience in flow in porous media and thermodynamics are highly appreciated.

The internship is located at *LEGI* laboratory at *University Grenoble Alpes*. It is expected to last for 5 to 6 months starting from early February 2023.

## Contacts

Please send you CV and motivation letter to:

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## References

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- Bergins, C., Sven Crone and Karl Strauss (2005). 'Multiphase flow in porous media with phase change. Part II: Analytical solutions and experimental verification for constant pressure steam injection'. In: *Transport in Porous Media* 60.3, pp. 275-300
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